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ABSTRACT

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FOR WHOM THE SCHOOL BELL TOLLS: THE IMPACT OF DROPPING OUT ON COGNITIVE PERFORMANCE

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The Center

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This report, prepared by the School Organization Program, examines the general issue of school effects by comparing the cognitive test performance of students who drop out after their sophomore year with students who graduate.

Abstract

Although much has been written about the ineffectiveness of schools in imparting cognitive skills, there is little reliable knowledge by which to judge such claims. While the typical school effectiveness study focuses on variation in educational outcomes between organizational units, there have been few studies which compared "school" and "non-school" populations. The purpose of this paper is to assess the contribution of formal schooling to cognitive development. Using data from the sophomore cohort of the High School and Beyond project, we compare patterns of cognitive development for graduates and dropouts over a two year interval. With the effects of social background, sophomore test performance, and prior academic adjustment controlled, the average difference in cognitive test performance that may be attributable to the effect of staying in school is about one-tenth of a standard deviation. Moreover, dropping out of school has its most severe negative effects upon disadvantaged students.

For Whom the School Bell Tolls:
The Impact of Dropping Out on Cognitive Performance

After a period of relative neglect, education again has assumed a prominent position in the forefront of the public policy agenda. Blue ribbon reports on the crisis in education have been offered in abundance (National Commission on Excellence, 1983; Task Force on Education for Economic Growth, 1983; Twentieth Century Fund, 1983, National Science Board Commission, 1983), proposals for school reform have either been passed or are under development in most state legislatures (Walton, 1983; Fiske, 1984), and the rhetoric from Washington made education policy a major issue in the recent election. In stark contrast to the education agenda of just a few years ago, however, today's central concerns have little to do with equity issues and the failures of our educational system vis-a-vis minorities. Rather, they involve largely matters of school quality, and in particular, the supposed failure of our schools to produce graduates who can cope with the occupational requirements and the exigencies of everyday life in a world of high technology. Declining test scores, watered-down mathematics and science curricula, and disturbingly high levels of both functional and scientific illiteracy are the kinds of issues that loom large in compendia of today's most pressing educational problems.

The purpose of the present analysis is to evaluate whether our schools actually are as ineffectual in imparting cognitive skills as current opinion seems to take them to be. Since so many claim already to know the answer, one might well ask if there really is cause for such an appraisal. In fact, however, there is not at present a reliable knowledge base by which to judge the cogency of these concerns regarding the effectiveness of American schools.

This is not to deny that problems exist. Rather, there is ample evidence from national testing data that many youngsters finish high school with cognitive skills well below any reasonable standard of adequacy. And we surely are not wanting for studies that evaluate how test performance responds to organizational variations both between and within schools. As is well known, early studies found school-to-school differences in cognitive outcomes to be very small when relevant input characteristics of students were taken into account. Although this literature was read by many as implying that schools don't make a difference, this is not quite correct. Such results indicate that schools with comparable students generally exhibit comparable achievement levels, implying that school differences are not terribly important. They do not tell us, though, what the situation would be in the absence of institutionalized education.

To determine the impact of schooling itself requires a quite different approach from that of the typical school effectiveness study. In such research attention focuses on the variation in educational outcomes (frequently, test scores) that is located between organizational units, be they schools, school districts, classrooms within schools, high school tracks, primary grade ability groups, etc. Such inquiry addresses quite important issues, for when it is done well it can reveal which organizational arrangements produce the best performance, the potential benefits that might be realized from altering those arrangements, and the contribution of organizational differences to the variation in outcomes observed among students who experience those differences. But this framework is exclusively introspective--it considers only the diversity in existing school structures. A quite different question, and one not often posed, is whether schooling itself serves a useful purpose.

The reason for this relative neglect of so fundamental a question is

not hard to fathom. With the democratization of educational access and the diffusion of compulsory schooling legislation, virtually all youth, at least in modern industrial states, attend school through the primary grades, and retention through the secondary level has increased dramatically in recent years (Meyer and Rubinson, 1975). As a practical matter, then, there simply are few opportunities to determine what formal schooling itself contributes to cognitive development.

But although such studies are uncommon, they are not entirely lacking. In fact, researchers have displayed uncommon ingenuity in attempting to structure "school" -- "non-school" comparisons. This modest literature includes studies on such diverse topics as national differences in the age at which children begin formal schooling, school closings during periods of war or other natural disaster, and the effects of alternate day or alternate semester schedules in remote areas. Some of this material is reviewed by Husen (1972).

The most recent, and perhaps most compelling, such inquiry is Heyn's (1978) comparison of cognitive development during the summer months against that observed during the school year. Her study population consisted of fifth and sixth graders from the Atlanta city public schools, whose academic progress was monitored for eighteen months. This period encompassed three test administrations, two in the fall at the beginning of successive academic years and one in the spring toward the end of the first year. Heyns reasoned that since most youngsters did not participate in formal academic programs during the summer, and certainly none as extensive as during the regular school session, the summer months could be thought of as an extended interruption of schooling. With this clever insight, she was able to take a rather unexceptional set of data and put it to quite

exceptional use, and by so doing document an important facet of the impact of schooling which had gone unnoticed in scores of conventional school effectiveness studies.

Heyns found that cognitive development was not uniform throughout the eighteen month period and, most critically, that it differed strikingly for advantaged and disadvantaged youngsters. Whereas whites exhibited growth throughout the year, the average performance of minority youngsters improved only during the school year. In fact, among minority youth test scores actually declined over the summer months. This general pattern of black-white differences was observed at most economic levels. Although the growth rate for minorities during the school year still fell short of that observed for whites, the disparity then was quite small relative to when schools were not in session, during which time the trends actually moved in opposite directions, with the scores for blacks declining, on average, and those for white ontinuing to advance. Heyns also determined that these differences were not attributable to more extensive summer school participation by whites. In fact, they were not much explicable by any of the many measures of summer experience she was able to consider.

What Heyns' analysis reveals is that schools do, in fact, play an important constructive role in fostering cognitive development, especially for disadvantaged minorities. Schooling, in effect, compensates partially for cognitive deficits in the home and community environments of disadvantaged youngsters; by implication, were it not for the school's intervention, the gap between the test scores of advantaged and disadvantaged youngsters would be even greater than it is observed to be.

It is important to appreciate that these effects of schooling only are apparent when out-of-school patterns of growth are compared against those observed during the school year. Heyns' study thus offers reason to

believe that schools actually accomplish a good deal more than is generally appreciated, and these accomplishments would not be revealed in the typical school effectiveness study.

The present inquiry follows Heyns' lead in comparing "in-school" with "out-of-school" cognitive development, but there the similarity ends. Rather than concern ourselves with test performance during the primary grades, we focus on cognitive outcomes at the secondary level. And rather than use the academic calendar to root out naturalistic variation in exposure to schooling, we turn to dropouts as our "unschooled" comparison group.

This focus is, we think, especially timely. Most critical commentary regarding the current crisis in education has been directed toward deficiencies at the secondary level, and it seems to us quite important to know whether this widespread perception of failure is valid. The situation of dropouts, moreover, is of intrinsic interest as a point of comparison. It is well known that high school dropouts fare poorly in the labor market (King, 1980), although it is less clear to what extent this is due exclusively to lack of schooling (Olneck, 1979). In any event, we know that numerous campaigns have been mounted over the years to encourage high risk youngsters to stay in school and get their diplomas, yet practically nothing is known regarding the non-economic consequences attending such decisions. Our analysis will reveal whether, and to what extent, dropouts suffer intellectually as a result of their withdrawal from school. At the individual level, such consequences would affect both the quality of daily life and one's economic and career prospects. At the collective level, they would have implications for our national stock of "intellectual capital" and all the issues upon which such cognitive capacity bears. (See

the report of the National Commission on Excellence in Education, 1983, for one assessment of how such cognitive difficiencies jeopardize the national interest.)

Our basic approach will be to compare patterns of cognitive development over a two year interval, with the spring of the sophomore year of high school serving as our benchmark. Our research makes use of data from the sophomore cohort of the High School and Beyond (HSB) project. This nationally representative sample was first tested in 1980 as sophomores, and the same battery of tests was re-administered two years later in the spring of 1982. The HSB fieldwork involved extensive efforts to secure information from dropouts and transfers as well as youngsters who stayed in school, and as a result this is one of the few large scale panels than can claim to be representative of an actual class cohort.

The HSB test battery includes assessments in several generic skill areas (e.g., vocabulary, mathematics, and reading) as well as several tests that are more closely tied to curriculum coverage (e.g., science, writing, and civics). For the two year interval covered by these data, our analysis will estimate the "value-added" in cognitive performance that can be attributed to persistence in school. If schools do, in fact, help foster intellectual development, then this should be revealed in superior growth among youth who stay in school. And, following Heyns, if formal schooling is most important for the intellectual development of disadvantaged youngsters, then the cognitive benefits associated with persistence in school should be most pronounced among minority and low SES youth.

METHODS

The data for this analysis are from the High School and Beyond (HSB) 1980 Sophomore Cohort Base Year (1980) and the First Follow-Up (1982)

surveys. The HSB study originally surveyed roughly 30,000 sophomores in more than 1,000 high schools across the country in the spring of 1980. The Base Year survey included both a questionnaire and a battery of cognitive tests (described more fully below). Eighty-four percent of the sampled students completed the sophomore questionnaire, and 77% completed the test battery.

The First Follow-Up of the HSB Sophomore Cohort was fielded in the spring of 1982. Four groups of students from the 1980 Base Year sophomore cohort were identified: students still enrolled in their Base Year schools, dropouts, early graduates and transfers. Students still enrolled in their Base Year schools at the time of the First Follow-Up were sampled with a probability of 1.0. The other three groups were sampled with a probability designed to produce a preset number of cases for the various school strata. The sample allocation consisted of 25,150 still-in-school seniors, 2,601 dropouts, 1,290 transfers to non-HSB schools, and 696 early high school graduates. Properly weighted, this sample projects to the population of roughly 3,800,000 high school sophomores of 1980.[1]

The response rate for the First Follow-Up is quite high for each of the four groups. The questionnaire completion rate ranged from 88% for the dropout group to 95% for the still-in-school senior group. The response rate for completed tests ranged from 78% of the dropout sample to 90% for the still-in-school sample.

HSB administered the same battery of tests to the 1980 Sophomore Cohort in the spring of both the 1980 Base Year and the 1982 First Follow-Up phases of data collection. The areas covered in the tests are vocabulary, mathematics, reading, science, writing, and civics education. Mathematics is constructed as the sum of two mathematics subtests.

Additionally, a composite score was constructed as the sum of the first three tests (i.e., vocabulary, mathematics, reading). The science, writing, and civics tests are designed to measure curriculum-specific achievement. For all tests we employ what are referred to as "formula" scores. These are raw scores (i.e., number of items correct) adjusted for guessing. Further information on the HSB tests can be found in Heyns and Hilton (1982).

Throughout these analyses, all correlations involving the test scores are corrected for attenuation due to random measurement error. Reliabilities for the sophomore tests, as reported by Heyns and Hilton (1982), range from .53 for civics, to .85 for the mathematics I test. From these figures, the estimated reliability for the composite is .92. Since reliability estimates for the follow-up instruments are not yet available, as an expedient we assume that the reliabilities are constant across the two administrations and apply these sophomore estimates to the senior tests as well. However, we do not use the same reliabilities for dropouts as for graduates since cognitive tests are often less reliable for low performers, and dropouts typically are low achievers (Bachman, et al., 1971; Pallas, 1984).

To determine any such reliability differences, we turned to differences in the observed time 1 - time 2 stability coefficients for the two groups. First, the senior year test scores were regressed on the sophomore year scores separately for the dropouts and graduates. The coefficients derived can be thought of as test-retest, or stability, measures. As expected, these coefficients were lower for the dropouts than for the non-dropouts for every test. Although we recognize that these differences are not necessarily due to lower test reliabilities among the dropouts, they nevertheless are consistent with that possibility and, for present

purposes, that is what we take them to signify. Hence, our reliability correction for the dropout sample was derived as the ratio of the dropout to non-dropout stability coefficients in each cognitive domain.[2] Procedurally then, reliabilities for the dropout group were derived as the product of the overall reliability and its corresponding stability ratio. The overall reliabilities reported above are used "as is" for the still-in-school group. For the dropouts, the corrected reliabilities range from .39 for the civics test to .74 for the writing test. The reliability for the test composite is .84. These are generally about .11 lower than those used for the graduates.

The remaining measures, which we use mainly as control variables, are from either the sophomore questionnaire or are composite measures derived from several sources.

Region of country is represented as three dummy variables: NEAST, for the Northeast; NC, for the North Central Region; and SOUTH, for the South. The ommitted region is the West.

Race/ethnicity is represented as two dummy variables. BLACK is coded 1 if black, 0 otherwise. HISPANIC is coded 1 if Hispanic, 0 otherwise. The omitted group is non-black non-Hispanics. Students who classified themselves as both black and Hispanic are coded as Hispanic. Race/ethnicity is derived from the HSB composite race item which uses all available information from both the Base-Year and First Follow-Up questionnaires.

Sex (SEX) is coded 1 if female and 0 if male.

Socioeconomic status (SES) is an equally weighted linear composite of standardized measures of father's education, mother's education, father's occupation, family income, and material possessions in the

household.

High school grades through the sophomore year (GRADES) are self-reported and scored on an eight point scale, ranging from "Mostly A's" (coded 1) to "Mostly Below D" (coded 8).

ABSENCE is the self-reported number of unexcused absences from school in the first half of the sophomore year of high school. Responses range from "None" (coded 1) to "21 or more" (coded 7).

RESULTS

As a point of departure, it is of some interest to consider how the performance of dropouts on the six cognitive tests compares with that of youngsters who stay in school. The basic patterns of cognitive growth between 1980 and 1982 for those students completing high school and those dropping out between the sophomore and senior years can be seen in Table 1.

------ Table 1 About Here------

The first five columns in table 1 present the means for dropouts and graduates on both the 1980 tests and the 1982 tests as well as the pooled standard deviations for the 1980 test. The sixth, seventh, eighth, and ninth columns of table 1 are derived from the first five columns. These display patterns of change within groups (columns eight and nine) and differences in performance levels between groups (columns six and seven).

It should come as no surprise that dropouts perform much more poorly on these tests than youngsters who stay in school. It is of interest, however, that these disparities already are quite pronounced <u>before</u> the dropouts have withdrawn from school. As column six shows, the differences in mean scores on the 1980 tests for graduates and dropouts range from 1.366 points on the civics test to 7.135 points on the math test. Expressed as fractions of a standard deviation, these differences seem

quite large, ranging from .513 on the civics test to .732 on the math test. Comparing the figures in column seven with those in column six suggests that to a considerable extent the differences observed two years later reflect simply the persistence of the pre-dropout pattern. The relative stability of these differences between the two groups is quite important, and our formal analyses will have to be sensitive to it. At the same time, however, the fact that in each case the difference between the graduate and dropout scores has increased slightly may be quite telling.

This pattern of differential growth is perhaps easier to see in the last two columns. Both groups of youngsters improve their test performance over the two year interval, but the improvement is consistently greater for youth who stay in school. The gains in cognitive achievement for dropouts on individual tests range from .570 points on the science test to 1.550 points on the vocabulary test. In terms of standard deviation units, these range from .062 on the math test to .310 on the civics test. The corresponding gains for graduates range from .943 points on the science test to 2.165 points on the vocabulary test. Expressed in standard deviation units these range from from .198 on the math test to .417 on the civics test. The patterning of group differences generally is quite consistent: for five of the six tests the graduate gains are between 1.3 and 1.7 times those of the dropouts. On the math test, however, the graduate increment is much more substantial, being 3.2 times that of the dropouts. Clearly then, cognitive growth is somewhat greater among youth who stay in school.

We might also consider these differences as fractions of a year's "growth". As a standard of comparison, we assume that a year's growth is one-half of the difference between the 1980 and 1982 test averages for a particular group in a particular domain. Taking the test composite for

purposes of illustration, we divide the difference between the change in the test performance of dropouts and that of graduates (2.477) by one-half of the change in the dropout scores between 1980 and 1982 (2.900/2 = 1.450). This tells us that the increase of graduate performance over dropout performance on the composite is about 1.7 years of dropout growth. Following the same procedure, but using graduate growth as the frame of reference (5.377/2 = 2.689), this same difference turns out to be about .9 years. In general, the superior growth evidenced by graduates equals about one year at the graduate rate and almost two years at the dropout rate. Thus, while the differences in the patterns of change in cognitive test performance between the two groups appear small in relation to the initial differences between the groups, they seem rather substantial when considered in relation to the expected annual change in the test performance of either group.[3]

Our formal analysis will attempt to isolate what portion of this greater growth is attributable to persistence in school as distinct from differences in the kinds of youngsters found in the two groups. We know that the differences in cognitive test performance of the dropouts and the graduates are highly consistent over the two year interval. This makes it particularly important that changes in cognitive performance be evaluated net of the kinds of background and performance characteristics known to differentiate students who leave high school early from those who graduate (Rumberger, 1983). Doing so should effectively isolate the contributions of schooling to the patterns of change observed in Table 1. This is the intent of the analysis reported in Table 2.

------ Table 2 About Here ------

Columns A through G of Table 2 present the results of multiple

regression analyses relating student background characteristics and 1980 test scores to performance on the 1982 cognitive tests, separately for dropouts and graduates. Column A identifies the test domain being considered. Column B lists the predictor variables included in the analyses. Columns C, D, and E contain the means, the unstandardized regression coefficients, and the R^2 for the analyses conducted using the dropouts in the sample. Columns F, G, and H contain the same data for the analyses conducted using the graduates in the sample.

In these data, about fourteen percent of the cohort is identified as having dropped out of high school sometime between the spring of the sophomore year and the spring of the senior year. This is a bit lower than national figures would lead us to expect, but the HSB design misses those youngsters who drop out at the first opportunity to do so (i.e., at the end of compulsory school attendance, or the beginning of tenth grade in many states) as well as those who don't withdraw until just before graduation. We don't know what fraction of the actual dropout population would fall in each category, but the latter group probably consists largely of youngsters who realize that they are not going to graduate and decide not to "stick it out."[4] These sources of slippage notwithstanding, the profile of the dropout group is very much as would be expected. As already shown, the dropouts are, on average, low achievers. This is reflected in their test scores, as well as in differences in self-reported grade point average (that for the dropout group being in the range of mostly C's", while the graduates average between "mostly B's" and "about half B's and half C's"). Additionally, the dropouts display somewhat lower commitment to schooling even before dropping out, as indicated by their higher levels of absenteeism during the first semester of the sophomore year. The absence "averages" in Table 2 correspond to an average of about five days for

dropouts, as compared with an average of two days for the graduates. The standard deviation for the dropout group (1.63) also is much larger than that for the graduate group (1.17), reflecting the disproportionate number of chronic truants in this group. (Incidentally, the averages differ somewhat from panel to panel in Table 2 because of minor differences in missing data patterns across the HSB tests. Our analysis sample consists of the unweighted cases with non-missing values for all the variables in a particular equation.)[5]

In addition to these academic differences, we also observe substantial, if not especially surprising, differences in the social backgrounds of these two groups of youngsters. They are disproportionately from lower status households.[6] In terms of racial/ethnic composition, the most striking feature is the over-representation of Hispanic youngsters: the dropout sample is between eighteen and nineteen percent Hispanic, compared to about twelve percent of the graduate sample. In comparison, blacks comprise only about twelve percent of the dropouts compared with between ten and eleven percent of the graduates. Recall, however, that youngsters who identified themselves as both black and Hispanic are classified as Hispanic for purposes of this analysis. About eight percent of the youngers classified as Hispanic also identify themselves as black.[7]

Finally, we also observe some interesting regional differences in the composition of the two groups. The South, historically, has lagged behind other regions of the country in the educational attainments of its citizenry, and this is reflected in the over-representation of dropouts from this region, with about 41% being from this area compared with 33% of the graduates. In comparison, graduates are relatively more numerous in all other regions.[8]

These quite substantial differences in the sorts of youngsters who comprise the dropout and graduate samples underscore our point made previously that a proper consideration of the contribution of schooling to cognitive development must take account of differences that would be anticipated from other, cognitively relevant, factors. To make the appropriate comparisons, we employ the technique of regression standardization.

Columns I through N in Table 2 present the results of a partial decomposition of the regression results reported in Columns D and G. Column I presents the predicted mean scores on the senior year cognitive tests implied by the use of the mean scores of the dropout population on the predictor variables together with the regression coefficients for the graduates. In other words, Column I provides an indication of how the dropouts would score on the senior year cognitive tests if they had continued in school as the graduates did (and realized the same cognitive "returns" on their various personal resources and chacteristics as realized by the graduates and as reflected in their slope estimates). Comparing the mean scores predicted in Column I with those actually observed for the dropouts and reported in the first column of Table 1 provides an indication of the improvement that would have been expected had the dropouts in the sample remained in school. This is the goal of most programs designed to reduce the dropout rate.

The results of this comparison are presented in Column K as points on the cognitive tests, and in Column M as standard deviation units. The differences in test scores range from .264 on the reading test to .808 on the writing test. On the test composite this difference is 1.477 points. Expressed as standard deviation units, the differences range from .04 on the math test to .20 on the civics test. For the test composite the figure

is .08.

Columns J, L, and N of Table 2 present the results of this same type of analysis using the mean scores of the graduate sample together with the regression coefficients for the dropout sample. In other words, the figures in Column L provide an indication of how those in the graduate sample would have fared on the senior year test if they had left school when those in the dropout sample did. The figures in Columns L and N are computed in the opposite direction as those in Columns K and M so that a positive figure always indicates the advantages realized by graduates as a result of staying in school. In Column L the differences in test scores range from -.027 on the civics test to 1.295 on the math test. On the test composite this difference is 2.071 points. These correspond to differences (reported in Column N) of from -.01 standard deviations on the civics test to .13 standard deviations on the math test. On the test composite this difference is .12 standard deviations.

Columns M and N present perhaps the most central results of this analysis. The average difference in cognitive test performance between dropouts and graduates that is not attributable to the predictor variables, and thus presumably attributable to the effect of staying in school, is about one-tenth of a standard deviation.

Recall that this benefit of schooling is derived with sophomore levels of test performance controlled, along with two important measures of prior academic adjustment and commitment: grade performance through the tenth grade and number of absences in the previous semester. Such measures control not only for developed competencies up to the period of our evaluation, but also differences of motivation and habit that likely are quite essential to academic success. What we see, then, are contributions

of schooling that are entirely independent of such attributes, making this not only a proper, but also a stringent, assessment. Schooling thus appears to benefit youngsters who persist academically by about a tenth of a standard deviation, on average. While there is considerable spread about this value, in practically all domains at least one of the two assessments produces a difference at or near the .10 threshold. In fact, we think it noteworthy that the largest gains to be anticipated for dropouts by staying in school appear on two of the curriculum-linked tests (i.e. civics and writing). These are .20 and .16 standard deviations, respectively. This pattern is consistent with the interpretation of these differences as being due to lack of formal schooling per se.

The findings thus far address our concern with the general effects of schooling on students, but as indicated earlier, we are also interested in how the decision to leave or remain in school affects particular groups of students. An examination of the regression coefficients for dropouts and graduates presented in Columns D and G of Table 2 allows us to consider this issue.

The most striking detail of these regression results is the extremely high stability observed for the cognitive traits themselves. In every instance the time 1 - time 2 regression coefficient borders on unity, and in a few instances it actually is on the high side of that boundary. These results are due in part to our corrections for random error in the tests, and the close correspondence of the stabilities for the dropout and graduate samples follows directly from our use of an additional correction factor for the former group.[9] But these adjustments, we believe, are quite proper. The high stabilities they produce presumably reflect an important feature of cognitive development: that the patterning of such traits is highly structured by the time youngsters reach late adolescence and not

much changed thereafter. The fact that levels of cognitive performance are well established by the middle of high school, and the relative ranking of youngsters practically invariant thereafter, is an important realization that must be considered by those who hold expectations for effective educational interventions. We will return to this issue in our concluding comments; for now, though, we mention it simply as an important backdrop to our other results.

In light of such extraordinary stability over the period spanned by our data, even small effects of schooling and of school experiences might be considered noteworthy, and we see ample indication of such. Our two school-related predictor variables, number of unexcused absences in the first half of the sophomore year and high school grades through the sophomore year, identify groups of students with histories of truancy and poor grades, respectively. On four of the six tests truants who drop out obtain lower test scores than truants who do not drop out. Only on the reading and math tests do truants who drop out obtain higher scores than those who stay in school. Among students with a history of poor grades, the pattern is more consistent. The negative impact of poor grades is greater for those who stay in school than for those who drop out for each of the six tests. The mixed pattern of effects for truants reflects the fact that both those truants who drop out and those who graduate experience the negative effects of missing in-school time, while the consistent trend for poor grades suggests that the discouraging effects of these grade evaluations only weigh upon those who stay in school. We think it noteworthy that these indicators of poor academic adjustment prior to our baseline observation continue to take their toll on cognitive growth even when sophomore test performance is held constant. Hence, even with the

extremely high levels of test stability observed in these data, student motivation and commitment still make a difference.

Turning to the social background characteristics, it is Hispanic youngsters who are most adversely affected by dropping out of school. For five of the six tests and for the test composite the negative impact of being Hispanic is greater among the dropouts than among the graduates. The negative coefficients for dropouts are typically two to three times as large as those for graduates.

Students with low socioeconomic status also seem to be particularly affected by dropping out of school. On five of the six tests the impact of socioeconomic status is greater among the dropout sample than among the graduate sample.[10] The results for blacks and for males-female differences are more mixed, but at least in terms of SES comparisons and the consequences among Hispanic youngsters there is some indication that dropping out of school has its most severe effects upon the disadvantaged. This is in line with the pattern observed for primary grade youngsters in Heyns' study of summer leaning.

DISCUSSION

The question we addressed in this paper is whether the cognitive performance of youth is improved as a result of their being in school. Our strategy was to compare the test performance of high school dropouts with that of youngsters who persisted in school at least through the end of their senior year. At the simplest level, the answer to our question seems clear: the cognitive skills of youngsters who stay in school improve more than those of dropouts, and this advantage is observed across a rather broad range of skill areas. Additionally, there is reason to think that the benefits which derive from schooling are greatest for curriculum-

specific competencies and for certain categories of disadvantaged youngsters, specifically Hispanic and low SES youth.

In light of the very rigorous assessment permitted by our research design, we are inclined to have considerable confidence in these conclusions. What is less clear from the evidence, though, is whether these advantages are important in any educationally meaningful sense. This is more a matter of judgment than fact, and determining the significance of a pattern of small differences is a chronic difficulty in school effectiveness research. The average difference in test score gains between dropouts and graduates was on the order of .10 standard deviations, which by a commonly used rule of thumb is right at the threshold of substantive significance. However, there are several reasons for thinking that these modest effects actually are indicative of quite important school influences. Although these considerations go beyond the evidence itself, we nevertheless think them reasonable extrapolations.

In the first place, it should be recalled that these modest differences were observed in the face of extremely high over-time stability in the underlying traits--most of our adjusted stability coefficients approached unity. It thus would seem that we have assessed the impact of schooling at a developmental stage when prospects for effective intervention are not at all promising. But the influence of schooling is not limited to late adolescence or to the last two years of high school. Rather, youngsters are exposed to the institutional environment of the school from the primary grades onward, and there is discussion in many areas of lowering the age of school entry even further. Since the cognitive benefits of schooling are apparent under the least favorable circumstances, even greater impact probably should be expected during the

earlier grades, when the traits themselves presumably are more fluid and receptive to experiential influence. If what we are observing is the end product of a cumulative, and decelerating, process, which seems to us quite reasonable, then the overall contribution of schooling to levels of cognitive development may well be quite substantial.

Second, our tests involve mainly generic skills and curriculum-linked assessments that are quite broadly applicable. This is entirely appropriate given the scope and intent of the HSB project. However, such skills assessments likely understate the importance of schooling for the development of cognitive competencies. It is reasonable to expect that formal exposure to learning opportunities will be of much greater consequence for subject-specific and curriculum-specific achievements. There can be little doubt that systematic exposure to many subjects and areas of knowledge occurs routinely only in school, and it seems likely that being in school would have a much greater impact in these kinds of areas than on the more generic skills tapped in the HSB battery. In neglecting such centrally important considerations, our analysis most surely is a conservative evaluation of the influence of schools.

Finally, the policy implied by our conclusion that schools have a meaningful impact on cognitive performance, i.e., developing programs to encourage adolescents to complete high school, is likely to have larger positive effects than those shown in our present analysis. Some of the very students who are most likely to leave school early, (i.e., low SES and Hispanic students), are those upon whom continued formal schooling confers the most benefit. Since our analysis calculates the benefits of schooling for a wide-ranging sample of students, this is yet another reason to suspect that our figures underestimate both the gains that might be realized from policies which encourage and enable those students who

presently drop out to complete high school, as well as the cognitive contributions of schooling more generally.

Regarding the situation of dropouts, it is a perverse irony that many current proposals for improving the quality of public education by raising standards and adding requirements may actually have the effect of pushing even greater numbers of youth out of high school before graduation (McDill, Natriello, and Pallas, 1985). If implemented without consideration of such unintended consequences, proposals for increased standards run the risk of actually depressing the aggregate gains in cognitive performance associated with schooling.

These are difficult and complicated issues that deserve fuller treatment than they can be accorded at pre[illegible] and we mention the issue of dropout prevention merely as one policy issue for which our results might have implications. We actually believe that some of the proposals for school reform could accomplish considerable good (Alexander and Pallas, 1984), although we hardly think any of them either comprehensive or wholly satisfactory as a blueprint for revitalizing the American education system. We also would think it a most welcome development were such scrutiny to rekindle a national commitment to school improvement that is properly appreciative of the many and varied responsibilities shouldered by our schools. The critical commentary surrounding our schools, though, rarely attempts a balanced appraisal of the good against the bad, and this is where the broad implications of our analysis come in. Our results indicate that sc[illegible]oling, as it is presently structured, plays an important role in fostering cognitive growth. We think this an important realization, which tends to be lost sight of in our preoccupation with the generally modest variability that is manifest in school-to-school differences and with [illegible]

distressingly low average levels of cognitive performance that are so prevalent. Even under the severe conditions imposed in our present analysis, the effects of schooling persist. Schools, then, do make a difference, and this deserves recognition.

Table 1

Comparisons in Scores on Six Cognitive Tests and the Test Composite Among Graduates and Dropouts in 1980 and 1982

Test	Dropout Means '80 Test	Graduate Means '80 Test	Dropout Means '82 Test	Graduate Means '82 Test	Pooled S.D.'s for '80 Test	Differences in Mean Scores on 1980 Tests in test points and S.D. units (Graduates - Dropouts)	Differences in Mean Scores on 1982 Tests in test points and S.D. units (Graduates - Dropouts)	Differences in Mean Scores for Dropouts in test points and S.D. units (1982 - 1980)	Differences in Mean Scores for Graduates in test points and S.D. units (1982 - 1980)
Vocabulary	5.819	9.123	7.369	11.288	5.326	3.304 .620	3.919 .736	1.550 .291	2.165 .406
Reading	4.481	7.211	5.279	8.467	4.772	3.030 .642	3.188 .675	.798 .169	1.256 .266
Math	6.482	13.617	7.090	15.545	9.750	7.135 .732	8.455 .867	.608 .062	1.928 .198
Science	6.731	9.333	7.301	10.276	4.589	2.602 .567	2.975 .648	.570 .124	.943 .205
Writing	5.478	8.828	6.738	10.490	5.133	3.350 .653	3.752 .731	1.260 .245	1.662 .324
Civics	3.391	4.757	4.218	5.867	2.665	1.366 .513	1.649 .619	.827 .310	1.110 .417
Composite	16.956	30.079	19.856	35.456	17.653	13.123 .743	15.600 .884	2.900 .164	5.377 .305

Table 2

Means, Regression Coefficients, and Difference Scores on the Six Cognitive Tests and the Test Composite for Graduates and Dropouts

A Dependent Variables	B Predictor Variables	C Dropout Means	D Dropout Reg. Coeff.	E R^2	F Graduate Means	G Graduate Reg. Coeff	H R^2	I (C * G)	J (D * F)	K I - Obs. Dr. Mean**	L Obs. Gr. Mean** - J	M K/ S.D.**	N L/ S.D.**
1982	80test	5.819	.997*	.892	9.123	1.004*	.962	7.758	10.918	.389	.370	.07	.07
Vocabulary	Absence	3.321	-.127*		2.099	-.047*							
Test	Grades	4.893	.042		3.436	-.049*							
	SES	-.409	.213*		.006	.093*							
	Sex	.468	.561*		.509	.253*							
	Black	.124	-.315*		.108	-.160*							
	Hispanic	.183	-1.040*		.118	-.418*							
	Neast	.166	.377*		.221	-.095*							
	Nc	.253	.364*		.296	-.161*							
	South	.409	.105		.331	-.223*							
	Constant		2.161			2.476							
1982	80test	4.481	.983*	.856	7.211	.944*	.871	5.543	8.103	.264	.364	.06	.08
Reading	Absence	3.324	.119*		2.098	-.076*							
Test	Grades	4.895	-.044*		3.427	-.144*							
	SES	-.408	.401*		.005	.182*							
	Sex	.468	-.189*		.509	-.044							
	Black	.123	-.064		.109	-.460*							
	Hispanic	.186	-.779*		.118	-.196*							
	Neast	.165	.021		.222	.102*							
	Nc	.253	-.499*		.294	-.043							
	South	.406	-.384*		.333	-.078							
	Constant		1.365			2.427							

1982 Math Test	80test	6.482	1.041*	1.015*	13.617	.989*	.922	7.497	14.250	.407	1.295	.04	.13
	Absence	3.302	-.103*		2.091	-.122*							
	Grades	4.873	.278*		3.424	-.395*							
	SES	-.415	-.058*		.008	.557*							
	Sex	.473	-.824*		.509	-.922*							
	Black	.121	.589*		.107	.216*							
	Hispanic	.182	-1.610*		.118	-.552*							
	Neast	.163	-.855*		.221	.549*							
	Nc	.261	-1.155*		.297	-.129							
	South	.401	-.818*		.332	-.115							
	Constant		.688			4.146							
1982 Science Test	80test	6.731	.940*	.905	9.333	.950*	.949	7.617	9.862	.316	.414	.07	.09
	Absence	3.309	.111*		2.092	-.058*							
	Grades	4.882	.009		3.430	-.049*							
	SES	-.411	.619*		.004	.062*							
	Sex	.470	-.949*		.508	-.246*							
	Black	.120	-.029		.108	-.230*							
	Hispanic	.184	.087		.117	-.271*							
	Neast	.162	-.062		.219	-.128*							
	Nc	.257	.515*		.298	-.237*							
	South	.406	-.447*		.338	-.395*							
	Constant		1.311			2.115							
1982 Writing Test	'80test	5.478	.909*	.838	8.828	.824*	.814	7.546	10.056	.808	.454	.16	.09
	Absence	3.312	-.093*		2.089	.046*							
	Grades	4.897	-.073*		3.428	-.207*							
	SES	-.415	.574*		.006	.143							
	Sex	.474	.895*		.506	.467*							
	Black	.120	-.939*		.106	-.335*							
	Hispanic	.189	-.588*		.116	-.446*							
	Neast	.164	-.270		.220	-.124*							
	Nc	.258	-.901*		.301	-.313*							
	South	.406	-.721*		.332	-.484*							
	Constant		3.163			4.154							

1982 Civics Test	'80test	3.391	.938*	.974	4.757	.901*	.875	4.761	5.894	.543	-.027	.20	-.01
	Absence	3.318	-.052*		2.089	.043*							
	Grades	4.879	-.006		3.429	-.142*							
	SES	-.414	.684*		.006	.040*							
	Sex	.471	-.252*		.506	-.038*							
	Black	.118	-1.237*		.104	-.265*							
	Hispanic	.188	-.962*		.117	-.335*							
	Neast	.163	-.801*		.219	-.324*							
	Nc	.259	-.802*		.302	-.108*							
	South	.407	-.483*		.332	.402*							
	Constant		2.505		2.302								
1982 Composite Test	'80test	16.956	.997*	.882	30.079	.998*	.924.	21.303	33.385	1.447	2.071	.08	.12
	Absence	3.305	-.062		2.090	-.227*							
	Grades	4.871	.021		3.423	-.478*							
	SES	-.414	.591*		.008	.743*							
	Sex	.472	-1.392*		.509	-.672*							
	Black	.122	.147		.106	-.184							
	Hispanic	.180	-3.268*		.117	-.862*							
	Neast	.163	.579		.221	.598*							
	Nc	.262	-1.185*		.298	-.202							
	South	.401	-1.208*		.332	-.322							
	Constant		5.507			8.036							

*Coefficient greater than or equal to 1.96 its standard error.
**Observed dropout and graduate means and pooled standard deviations appear in Table 1.
*Forced entry of all predictor variables resulted in negative residual sum of squares.

FOOTNOTES

1. Our analysis uses the HSB weighting factor for cases having panel testing data.

2. On the chance that background controls might partially proxy the very differences in which we were interested, we also tested whether these different stability coefficients became more similar when other background controls were included in the equations. They did not. Hence, we retained the zero-order stabilities as the basis for the differential reliability estimates.

3. We have found both the standard deviations and the year's "growth" scores useful bases of comparison in considering differences in the 1980 and 1982 cognitive scores for graduates and dropouts. The former provide some idea of the size of these differences in light of the existing natural variation at one point in time, while the latter provide a sense of the size of the differences compared to possible change over time.

4. This group represents about two percent of the seniors.

5. The sample weights are proportional to the unweighted N, so that the weighted sample size is equal to the unweighted sample size. The sample size for the analyses involving the graduates ranges from 17,343 to 18,531; that for the analyses involving the dropouts ranges from 2,414 to 2,637.

6. The SES composite is scaled to have a pooled sample mean of zero and standard deviation of about .7. It has five components, each scaled to a mean of zero and standard deviation of one, and is constructed of the mean of the non-missing components. The dropout average SES level is more than one-half of a standard deviation below that of the graduates.

7. In 1982 blacks comprised 16.1% of the school-age population, while Hispanics comparised 8.0% of the school-age population (National Center for Educational Statistics, 1983).

8. The South consists of the South Atlantic, East South Central, and West South Central census regions which range from Delaware to Texas.

9. The uncorrected zero-order stability coefficients for the two groups (dropouts/graduates) are as follows: vocabulary (.675/.794), reading (.633/.726), math (.689/.833), science (.635/.730), writing (.665/.718), civics (.365/.493), test composite (.784/.883).

10. In their research comparing cognitive performance in public and private schools, Coleman, Hoffer, and Kilgore (1982) have interpreted such slope differences as indicative of a "common school" effect (i.e. smaller slopes implying greater equality across racial/ethnic and socioeconomic groupings). In light of the widespread disparagement of public schools in the present climate, the "uncommon school effect" might be a more apt characterization for the lesser dependency of test scores on these background characteristics among graduates.

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